

**IN THE CLAIMS:**

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 1, 4, 8, 9, 12, 16, 17 and 18 in accordance with the following:

1. (CURRENTLY AMENDED) An optical amplifier, comprising:  
an input power detecting unit that detects an input power of an optical signal;  
an output power detecting unit that detects an output power of the optical signal;  
an optical amplifying unit that amplifies the optical signal;  
~~a change factor detecting unit that detects a factor that causes a gain of the optical amplifying unit to change; and~~  
~~a control unit that provides a control, based on the input power, the output power, and the factor, so that the gain of the optical amplifying unit is a predetermined value, wherein~~  
~~the change factor detecting unit detects a value of a factor that depends upon the input power of the optical signal; and~~  
~~the control unit uses a result of addition of the value of the factor and the input power to provide the control.~~  
a control unit that calculates a factor that depends upon the input power and causes a gain of the optical amplifying unit to change, and controls the optical amplifying unit to keep the gain constant based on the output power and a result of addition of the input power and the factor.
2. (CANCELLED)
3. (CANCELLED)
4. (CURRENTLY AMENDED) The optical amplifier according to claim 1, wherein:  
~~the change factor detecting unit detects a value of a factor that~~the factor ~~depends upon both the input power of the optical signal and a temperature of the optical amplifying unit; and~~  
~~the control unit uses a result of addition of the value of the factor and the input power to provide the control.~~

5. (WITHDRAWN) The optical amplifier according to claim 1, wherein:  
the change factor detecting unit detects a value of a factor that depends upon the output power of the optical signal, and  
the control unit uses a result of subtraction of the value of the factor from the output power to provide the control.

6. (WITHDRAWN) The optical amplifier according to claim 1, wherein:  
the change factor detecting unit detects a value of a factor that depends upon a temperature of the optical amplifying unit, and  
the control unit uses a result of subtraction of the value of the factor from the output power to provide the control.

7. (WITHDRAWN) The optical amplifier according to claim 1, wherein:  
the change factor detecting unit detects a value of a factor that depends upon both the output power of the optical signal and a temperature of the optical amplifying unit, and  
the control unit uses a result of subtraction of the value of the factor from the output power to provide the control.

8. (CURRENTLY AMENDED) The optical amplifier according to claim 1, wherein:  
~~the optical amplifying unit includes an excitation laser diode, and~~  
the control unit controls ~~the an~~ an excitation laser diode to provide the control; included in the optical amplifying unit.

9. (CURRENTLY AMENDED) A control method for an optical amplifier, comprising:  
detecting an input power of an optical signal;  
detecting an output power of the optical signal;  
amplifying the optical signal by an optical amplifying unit;  
~~detecting~~ calculating a factor that depends upon the input power and causes a gain of the optical amplifying unit to change; and  
~~providing a control, based on the input power, the output power, and the factor, so that the gain of the optical amplifying unit becomes constant, wherein:~~  
~~the detecting the factor includes detecting a value of a factor that depends upon the input power of the optical signal; and~~

~~the providing the control includes using a result of addition of the value of the factor and the input power to provide the control.~~

controlling the optical amplifying unit to keep the gain constant based on the output power and a result of addition of the input power and the factor.

10. (CANCELLED)

11. (CANCELLED)

12. (CURRENTLY AMENDED) The control method according to claim 9, wherein:  
~~the detecting the factor includes detecting a value of a factor that the factor depends upon both the input power of the optical signal and a temperature of an the optical amplifying unit that amplifies the optical signal, and~~

~~the providing the control includes using a result of addition of the value of the factor and the input power to provide the control.~~

13. (WITHDRAWN) The control method according to claim 9, wherein:  
the detecting the factor includes detecting a value of a factor that depends upon the output power of the optical signal, and  
the providing the control includes using a result of subtraction of the value of the factor from the output power to provide the control.

14. (WITHDRAWN) The control method according to claim 9, wherein:  
the detecting the factor includes detecting a value of a factor that depends upon a temperature of an optical amplifying unit that amplifies the optical signal, and  
the providing the control includes using a result of subtraction of the value of the factor from the output power to provide the control.

15. (WITHDRAWN) The control method according to claim 9, wherein:  
the detecting the factor includes detecting a value of a factor that depends upon the output power of the optical signal and a temperature of an optical amplifying unit that amplifies the optical signal, and  
the providing the control includes using a result of subtraction of the value of the factor from the output power to provide the control.

16. (CURRENTLY AMENDED) The control method according to claim 9, wherein the ~~providing control controlling~~ includes controlling an excitation laser diode included in an the optical amplifying unit ~~that amplifies the optical signal~~.

17. (CURRENTLY AMENDED) An optical amplifier receiving and amplifying an input optical signal and producing an output optical signal, comprising:

a power detecting unit that detects at least one of an input power of the input optical signal and an output power of the output optical signal and produces a corresponding power detection output;

a temperature detecting unit that detects an operating temperature of ~~the optical amplifier, an erbium-doped fiber (EDF),~~ a change in the operating temperature causing the gain of the optical amplifier to change, and ~~producing~~ produces a corresponding temperature detection output; and

a control unit that calculates a power of an amplified spontaneous emission (ASE) ~~producing a control output,~~ based on the power and temperature detection outputs, to maintain the gain of the optical amplifier at a predetermined value.

18. (PREVIOUSLY PRESENTED) The optical amplifier according to claim 17, wherein:

the power detecting unit detects the input power and the output power, respectively, of the input and output optical signals and produces the corresponding power detection output based on both thereof.